Listing of the Claims:

This listing of claims replaces all prior versions and listings of claims in the application:

1. (Previously Presented) A method of manufacturing a metal oxide, metal oxyhydroxide or metal hydroxide product, said product having a sub-micron primary particle size, comprising:

- introducing a solid reactor filling material into a reactor,

- introducing a metal-containing precursor into said reactor,

- introducing a co-solvent into said reactor,

- introducing a supercritical solvent into said reactor,

whereby a contact between the metal-containing precursor and the co-solvent is established, and

- forming said product in the proximity of said solid reactor filling material.

2-71. (Canceled)

72. (Previously Presented) An apparatus for manufacturing a metal oxide, metal oxyhydroxide or metal hydroxide product, said product having a sub-micron primary particle size, said apparatus comprising:

- a solid reactor filling material in a reactor,

- means for introducing a metal-containing precursor into said reactor,

- means for introducing a co-solvent into said reactor,

- means for introducing a supercritical solvent into said reactor,

- said reactor adapted to establish a contact between the metal-containing precursor and the co-solvent, and

- said reactor adapted to form said product in the proximity of said solid reactor filling material.

73. (Previously Presented) The apparatus of claim 72, further comprising means for introducing the solid reactor filling material into the reactor.

74. (Previously Presented) The apparatus of claim 72, further comprising means for extracting the solid reactor filling material from the reactor.

75. (Previously Presented) The method of claim 1, wherein the forming of said product takes place by a process involving at least a sol-gel reaction.

76. (Previously Presented) The method of claim 1, wherein the metal oxide, the metal oxyhydroxide or the metal hydroxide product is substantially crystalline.

77. (Previously Presented) The method of claim 1, wherein the metal oxide, the metal oxyhydroxide or the metal hydroxide product is substantially amorphous.

78. (Previously Presented) The method of claim 1, wherein the metal oxide, the metal oxyhydroxide or the metal hydroxide product is a mixture comprising at least two different phases.

79. (Previously Presented) The method of claim 1, wherein the introduction of the solid reactor filling material, the metal-containing precursor, the co-solvent, and the supercritical solvent into the said reactor is done in arbitrary order.

80. (Previously Presented) The method of claim 1, wherein at least one of the solid reactor filling material, the metal-containing precursor, the co-solvent, or the supercritical solvent is mixed with at least one of the solid reactor filling material, the metal-containing precursor, the co-solvent or the supercritical solvent before introduction into said reactor.

81. (Previously Presented) The method of claim 1, wherein the metal oxide, the metal oxyhydroxide or the metal hydroxide product is manufactured in a mode comprising: a batch mode, a quasi-batch mode or a substantially continuous mode.

82. (Previously Presented) The method of claim 1, wherein a temperature in the reactor during the forming of said product is kept at a fixed temperature.

83. (Previously Presented) The method of claim 1, wherein a temperature in the reactor during the forming of said product is performed at an increasing temperature.

84. (Previously Presented) The method of claim 1, wherein a temperature in the reactor during the forming of said product is performed at a decreasing temperature.

85. (Previously Presented) The method of claim 1, wherein a temperature in the reactor during the forming of said product is performed using a temperature profile including an arbitrary combination of at least two of the following temperature profiles: a fixed temperature, an increasing temperature, and a decreasing temperature.

86. (Previously Presented) The method of claim 82, wherein the maximum temperature in the reactor during the forming of said product is 400°C, 300°C, 200°C, 100°C, or 50°C.

87. (Previously Presented) The method of claim 1, wherein a pressure in the reactor during the forming of said product is kept at a fixed pressure.

88. (Previously Presented) The method of claim 1, wherein a pressure in the reactor during the forming of said product is performed at an increasing pressure.

89. (Previously Presented) The method of claim 1, wherein a pressure in the reactor during the forming of said product is performed at a decreasing pressure.

90. (Previously Presented) The method of claim 1, wherein a pressure in the reactor during the forming of said product is performed using a pressure profile including an arbitrary combination of at least two of the following pressure profiles: a fixed pressure, an increasing pressure, and a decreasing pressure.

91. (Previously Presented) The method of claim 1, wherein the supercritical solvent is CO_2, and the minimum pressure in the reactor during the forming of said product is 74 bar, 80 bar, 90 bar, or 100 bar.

92. (Previously Presented) The method of claim 1, wherein the supercritical solvent is CO_2, and the minimum temperature in the reactor during the forming of said product is 31°C, 43°C, 100°C, 200°C, 300°C, or 400°C

93. (Previously Presented) The method of claim 1, wherein the supercritical solvent is isopropanol, and the minimum pressure in the reactor during the forming of said product is 47 bar, 80 bar, 90 bar, or 100 bar.

94. (Previously Presented) The method of claim 1, wherein the supercritical solvent is isopropanol, and the minimum temperature in the reactor during the forming of said product is 235°C, 250°C, 270°C, 300°C, or 400°C.

95. (Previously Presented) The method of claim 1, wherein the supercritical solvent is in supercritical phase before the introduction into said reactor.

96. (Previously Presented) The method of claim 1, wherein the supercritical solvent is brought into a supercritical phase after the introduction into said reactor.

97. (Previously Presented) The method of claim 1, wherein the maximum time for the forming of said product is 1 hour, 0.75 hours, or 0.5 hours.

98. (Previously Presented) The method of claim 1, wherein the maximum time for the forming of said product is 8 hours, 6 hours, or 2 hours.

99. (Previously Presented) The method of claim 1, wherein the maximum time for the forming of said product is 24 hours, 17 hours, or 10 hours.

100. (Previously Presented) The method of claim 1, further comprising introducing a plurality of different metal-containing precursors into said reactor.

101. (Previously Presented) The method of claim 1, further comprising introducing into said reactor a metal-containing precursor which is a metal alkoxide.

102. (Previously Presented) The method of claim 1, further comprising introducing into said reactor a metal-containing precursor comprising: titanium tetraisopropoxide, titanium butoxide, titanium ethoxide, titanium methoxide, and mixtures thereof.

103. (Previously Presented) The method of claim 1, further comprising introducing into said reactor a metal-containing precursor comprising: aluminium isopropoxide, aluminium-sec-butoxide, and mixtures thereof.

104. (Previously Presented) The method of claim 1, further comprising introducing into said reactor a metal-containing precursor which is magnesium ethoxide.

105. (Previously Presented) The method of claim 1, further comprising introducing into said reactor a metal-containing precursor which is a metal salt.

106. (Previously Presented) The method of claim 1, further comprising introducing into said reactor a metal-containing precursor which is $Ti(SO_4)_2$.

107. (Previously Presented) The method of claim 1, further comprising introducing into said reactor a metal-containing precursor comprising: $TiCl_4$, $AlCl_3$, and mixtures thereof.

108. (Previously Presented) The method of claim 1, wherein the co-solvent comprises: water, ethanol, methanol, hydrogenperoxide, isopropanol, and mixtures thereof.

109. (Previously Presented) The method of claim 1, wherein a plurality of different co-solvents is introduced into said reactor.

110. (Previously Presented) The method of claim 1, wherein the solid reactor filling material functions as a heterogeneous catalyst.

111. (Previously Presented) The method of claim 108, wherein the solid reactor filling material comprises at least one promoter.

112. (Previously Presented) The method of claim 1, wherein the solid reactor filling material includes at least one fiber.

113. (Previously Presented) The method of claim 1, wherein the solid reactor filling material includes a powder.

114. (Previously Presented) The method of claim 1, wherein the solid reactor filling material has a shape comprising: a sponge, a grid, a wad of fibers, and a sheet.

115. (Previously Presented) The method of claim 1, wherein the solid reactor filling material has a substantially porous structure.

116. (Previously Presented) The method of claim 1, wherein the solid reactor filling material has a size and shape capable of substantially confining the metal-containing precursor to a limited part of the reactor.

117. (Previously Presented) The method of claim 1, wherein the solid reactor filling material comprises a polymer.

118. (Previously Presented) The method of claim 117, wherein the polymer comprises: polystyrene (PS), polypropylene (PP), polyethylene (PE), polyvinyl chloride (PVC), polyvinylidene chloride (PVDC), polyvinyl acetate (PVAc) or mixtures thereof.

119. (Previously Presented) The method of claim 117, wherein the polymer comprises: acrylic polymer, fluorinated polymer, diene polymer, vinyl copolymer, polyamide polymer, polyester polymer, polyether polymer, polyimide polymer, and mixtures thereof.

120. (Previously Presented) The method of claim 1, wherein the solid reactor filling material comprises a metal.

121. (Previously Presented) The method of claim 120, wherein the metal comprises: titanium, aluminum, zinc, vanadium, magnesium, zirconium, chromium, molybdenum, niobium, tungsten, copper, iron, or mixtures thereof.

122. (Previously Presented) The method of claim 1, wherein the solid reactor filling material comprises a metal oxide.

123. (Previously Presented) The method of claim 122, wherein the metal oxide comprises: titanium oxide, zinc oxide, copper oxide, aluminum oxide, vanadium oxide, magnesium oxide, zirconium oxide, chromium oxide, silicon oxide, molybdenum oxide, niobium oxide, tungsten oxide, iron oxide, or mixtures thereof.

124. (Previously Presented) The method of claim 1, wherein the solid reactor filling material comprises a ceramic.

125. (Previously Presented) The method of claim 1, wherein the solid reactor filling material comprises a metal sulfate.

126. (Previously Presented) The method of claim 1, wherein the solid reactor filling material comprises a metal halide.

127. (Previously Presented) The method of claim 1, wherein the solid reactor filling material comprises a metal oxide, a metal oxyhydroxide or a metal hydroxide identical to said product formed in said reactor.

128. (Previously Presented) The method of claim 1, wherein the solid reactor filling material is a seed material for the forming of said product.

129. (Previously Presented) The method of claim 1, wherein the solid reactor filling material is a collecting agent for said product.

130. (Previously Presented) The method of claim 1, wherein said product is separable from the solid reactor filling material with no further treatments of the solid reactor filling material.

131. (Previously Presented) The method of claim 1, wherein said product is separable from the solid reactor filling material without substantially degrading the solid reactor filling material.

132. (Previously Presented) The method of claim 1, wherein said product is separable from the solid reactor filling material in a way that allows the solid reactor filling material to be re-used as solid reactor filling material.

133. (Previously Presented) The method of claim 1, wherein said product is separable from the solid reactor filling material by flushing the solid reactor filling material in a fluid.

134. (Previously Presented) The method of claim 1, wherein said product is separable from the solid reactor filling material by vacuum means.

135. (Previously Presented) The method of claim 1, wherein said product is separable from the solid reactor filling material by blowing means.

136. (Previously Presented) The method of claim 1, wherein said product is separable from the solid reactor filling material by ultrasonic means.

137. (Previously Presented) A metal oxide, metal oxyhydroxide, or metal hydroxide product manufactured by the method of claim 1, wherein the metal oxide, the metal oxyhydroxide, or the metal hydroxide product comprises aggregates of primary particles with a maximum average primary particle size of 1000 nm, 500 nm, or 100 nm.

138. (Previously Presented) A metal oxide product manufactured by the method of claim 1, wherein the metal oxide, the metal oxyhydroxide or the metal hydroxide product comprises

aggregates of primary particles with a maximum average primary particle size of 100 nm, 50 nm, 20 nm, or 10 nm.

139. (Previously Presented) A metal oxide product manufactured by the method of claim 1, wherein the metal oxide product is TiO_2, with a minimum crystallinity of 20%, 30%, 40%, 60%, or 80%.

140. (Previously Presented) A metal oxide product manufactured by the method of claim 1, wherein the metal oxide product is TiO_2 of anatase structure.

141. (Previously Presented) A metal oxide product manufactured by the method of claim 1, wherein the metal oxide comprises: Al_2O_3, TiO_2 , ZrO_2, Y_2O_3, WO_3, Nb_2O_5, TaO_3, CuO, CoO, NiO, SiO_2, Fe_2O_3, ZnO and mixtures thereof.

142. (Previously Presented) A metal oxyhydroxide product manufactured by the method of claim 1, wherein the metal oxyhydroxide comprises: iron oxyhydroxide, titanium oxyhydroxide, manganese oxyhydroxide, aluminium oxyhydroxide, and mixtures thereof.

143. (Previously Presented) A metal oxyhydroxide product manufactured by the method of claim 1, wherein the metal oxyhydroxide is aluminium oxyhydroxide of Boehmite structure.

144. (Previously Presented) A metal hydroxide product manufactured by the method of claim 1, wherein the metal hydroxide comprises: iron hydroxide, silicon hydroxide, zirconium hydroxide, titanium hydroxide, manganese hydroxide, aluminum hydroxide, and mixtures thereof.

145. (Previously Presented) A metal oxide product manufactured by the method of claim 1,

wherein the metal oxide, the metal oxyhydroxide or the metal hydroxide product comprises aggregates of primary particles with a maximum average primary particle size of 100 nm, 50 nm, 20 nm, or 10 nm;

wherein the metal oxide product is TiO_2, with a minimum crystallinity of 20%, 30%, 40%, 60%, or 80%; and,

wherein the metal oxide comprises: Al_2O_3, TiO_2 , ZrO_2, Y_2O_3, WO_3, Nb_2O_5, TaO_3, CuO, CoO, NiO, SiO_2, Fe_2O_3, ZnO and mixtures thereof.